

northern portion of the country. The highs themselves diminished in energy after reaching the Lake region, only to increase again on reaching the Atlantic.

NEW ENGLAND FORECAST DISTRICT.

The weather was of the midsummer type, and devoid of special features. While the temperature over the entire district was practically normal, a period of unusually oppressive weather, with high per cent of humidity and warm nights obtained from the 8th to the 20th, inclusive, during which there were numerous prostrations and a number of deaths. The precipitation was normal to excessive in the northern portions and generally deficient in the southern portions of the district. The usual number of severe electrical storms and downpours of rain occurred, which, in a number of instances, resulted in much damage to property and some loss of life. There were no windstorms or heavy gales, and no storm warnings were issued during the month.—*J. W. Smith, District Forecaster, Boston, Mass.*

NORTH-CENTRAL FORECAST DISTRICT.

The most prominent feature of the month was the warm wave of the second decade, which was attended by the highest temperatures of the present summer. This warm wave was an apparent result of the persistent southwest winds and dry weather in the central valleys and over the Great Plains that attended low barometric pressure in the Northwest and high pressure over the South Atlantic States. The termination of the warm period in this district was accurately forecast. Storm warnings were ordered, except for western Lake Superior, in connection with a rather severe storm that advanced over the upper Lake region on the 4th. Low temperature for the season was indicated for the cranberry marshes of Wisconsin on the 23d and 24th, and advices were issued that the minimum in the marshes would be 32° to 40°. Frost was not, however, forecast. A minimum of 35° was reported at Grand Rapids, Wis., the night of the 25th. On July 31, light frost was forecast for Minnesota, the low-lying sections of Wisconsin, and the interior of northern Michigan. Frost was reported at Duluth, Minn., and Escanaba, Mich., on the morning of August 1. An area of showers, heavy in some localities, drifted over the district from the 25th to 28th, their occurrence being announced in the forecasts.—*E. B. Garriott, Professor of Meteorology, Chicago, Ill.*

CENTRAL FORECAST DISTRICT.

The month was marked by numerous thunderstorms and heavy rains, but no very destructive storms. Well defined disturbances passed over the district on the 9-10th and the 21st-22d, causing more or less severe local storms and heavy rainfalls. The rain periods were 1st-4th, 6-13th, 20th-23d, and 28-29th. The temperature was about normal with practically only one heated period, the 15-20th.—*Ferdinand J. Walz, District Forecaster, Louisville, Ky.*

WEST GULF FORECAST DISTRICT.

No special warnings were issued and there were no disturbances along the Gulf coast during the month. Frequent showers occurred over the eastern and northern portions of the district causing a heavy monthly rainfall. The showers were generally covered by the forecasts of the Bureau. Very few verifying temperature changes occurred during the month.—*I. M. Cline, District Forecaster, New Orleans, La.*

ROCKY MOUNTAIN FORECAST DISTRICT.

The month was cooler than usual on the eastern and southern slopes. Thunderstorms were forecast for New Mexico daily from the 19th to the 27th, inclusive. During the first two days of this period the rainfall was light, but after the 21st heavy local downpours occurred in the Capitan, Sacramento, and Guadalupe mountains. Coincident with the coming of the flood waters from the mountains, heavy rains set in at lower altitudes to the eastward. These rains caused some quite severe floods of which mention is made in the subsequent

article on Rivers and Floods.—*F. H. Brandenburg, District Forecaster, Denver, Colo.*

SOUTH PACIFIC FORECAST DISTRICT.

A well marked area of high pressure began moving inland from the ocean on the 1st and caused a steady rise in temperature, commencing in California on the 2d and in Nevada on the 3d. A severe warm wave developed over the entire district on the 4th, reaching its crest on the California coast on the 7th, in the interior of the State on the 8th, and in Nevada on the 9th. During this period the temperatures at many places reached or exceeded all previous records. In the interior valleys, temperatures of 115° and 116° were reported. Some fruit was injured by the heat, but otherwise the damage was slight. The greater portion of the month was marked by temperatures slightly below the normal in the interior and by cool, foggy weather on the coast.—*G. A. Willson, Local Forecaster, Temporarily in Charge, San Francisco, Cal.*

NORTH PACIFIC FORECAST DISTRICT.

No special warnings were required and none were issued. Beginning on the 20th an area of low pressure formed over the interior of the district, where it remained until the end of the month. Some few thunderstorms resulted from this distribution of pressure, but in general the weather was dry and warm. About the 26th the atmosphere became smoky west of the Cascade Mountains and two days later the smoke spread to include most of the district. All rivers and streams fell to an unusually low stage.—*Edward A. Beals, District Forecaster, Portland, Oreg.*

RIVERS AND FLOODS.

During the month there were quite a number of floods, limited as to territory, yet comparatively destructive. The rivers principally affected were the Mississippi within the State of Minnesota; the Missouri and its tributaries from South Dakota to Missouri; Spring River of Missouri and Indian Territory, an important tributary of the Neosho; the White River of Arkansas; and the Pecos River in New Mexico and Texas. There were also several rises of comparatively unimportant character in the Red, the James River of Virginia, and the rivers of North Carolina and South Carolina.

The Minnesota floods were caused by heavy rains from the 3d to the 6th, inclusive, and danger-line stages prevailed until the middle of the month. At St. Cloud, Minn., the highest stage was 7.2 feet, 3.2 feet above the danger line, on the 8th and 9th; and at St. Paul 14.8 feet on the 11th, 0.8 foot above the danger line, the highest stage reached since 1897. Warnings of the floods were issued whenever necessary, but the flood waters did considerable damage to river farms, particularly in Aitken County. In the vicinity of St. Paul and Minneapolis considerable inconvenience was caused by the flooding of the flats.

The Missouri River flood was of fair proportion and much damage was done, especially in the vicinity of Pierre, S. Dak., where the Teton, or Bad River, as it is popularly known, was in flood after the heavy rains of the 2d and 3d, and caused the loss of seven lives and a great amount of property. Seventeen houses, several with their entire contents, in Fort Pierre, S. Dak., were swept down the Missouri and the bridge across the Red River was carried away. The losses are estimated to have been from \$75,000 to \$100,000. The river gage was carried away during the night of the 3d and 4th, so that no record of the stage of the water could be obtained; a record may be obtained by survey. Considerable damage was also done between Sioux City and Kansas City, where the stage of water varied from two to five feet above the danger lines. Farmers in the lowlands were the principal sufferers.

The Spring River flood caused the loss of one life and property to the extent of several hundred thousands of dollars. No flood service is maintained on this river.

Warnings were issued whenever possible for these floods and also for the rises in the Red, the James, and the rivers of North Carolina and South Carolina. The following report on the Pecos River flood was prepared by Mr. F. H. Brandenburg, Official in Charge, U. S. Weather Bureau office, Denver, Colo.:

After the 21st heavy local downpours occurred in the Capitan, Sacramento, and Guadalupe mountains. Coincident with the coming of the flood waters from the mountains, heavy rains set in over the lower altitudes to the eastward. Only moderate stages prevailed in the Pecos above Roswell, N. Mex., but below that point the river rose rapidly, as each tributary was at flood stage. The Penasco and Felix washed out a county bridge and some railroad bridges. The Hondo, which empties into the Pecos near Roswell, was reported to be very high, but there was no serious damage owing to the protection afforded by the new dikes. On the 26th the stage of the Pecos at Carlsbad was 14.2 feet, and on the morning of the 28th, near Pecos, Tex., the gage showed 18.3 feet, or a rise of ten feet in 48 hours. After remaining practically stationary for 24 hours the river fell rapidly, falling below the danger line on August 1.

Interests at Roswell were advised on the morning of the 23d that a sharp rise in the Hondo was expected, and the general manager of the Barstow Irrigation Company, at Barstow, Tex., was informed of the heavy rainfall in the mountain districts. On this date there was a scarcity of water for irrigation, the gage reading at the flume at Barstow

being only one foot. On the morning of the 25th all points between Carlsbad and Barstow were advised of approaching flood stages. To Pecos and Barstow the following warning was sent: "High water by Thursday night, 27th; river will continue rising." While for other points up stream the time set was correspondingly earlier. These timely warnings were fully appreciated, and resulted in the saving of much property.

The flood in the White River of Arkansas began on the 29th after two days of excessive rainfall over the watershed, and by the close of the month danger-line stages were general, with the river still rising. Warnings were first issued on the 28th. A report of this flood will appear at a later date.

The highest and lowest water, mean stage, and monthly range at 279 river stations are given in Table VI. Hydrographs for typical points on seven principal rivers are shown on Chart V. The stations selected for charting are Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.—H. C. Frankenfield, Professor of Meteorology.

CLIMATE AND CROP SERVICE.

By Mr. JAMES BERRY, Chief of Climate and Crop Division.

The following summaries relating to the general weather and crop conditions during July are furnished by the directors of the respective sections of the Climate and Crop Service of the Weather Bureau; they are based upon reports from cooperative observers and crop correspondents, of whom there are about 3300 and 14,000, respectively:

Alabama.—Rainfall heavy to locally excessive in some northern, middle, and southwestern counties, insufficient elsewhere. Cotton made fairly good growth and fruited moderately well until latter part of month, when crop was deteriorating over half the State, with rust spreading and shedding becoming general; grown bolls numerous by 20th, some opening during last few days. Corn and minor crops advanced fairly well; early corn maturing and late corn earing well last decade, when considerable fodder was pulled.—F. P. Chaffee.

Arizona.—Frequent, though light, local rains and thunderstorms last half of month revived vegetation generally and afforded a plentiful water supply for irrigation and stock. Wheat, barley, and oat harvest completed in south and central portions 15th. Second and third alfalfa cuttings not finished in northern and central sections; fourth crop blooming in southern. Light frost 15th and hail 19th and 26th damaged gardens and fruit. Large grape shipments. Stock thrifty. Late corn crop making good growth.—L. N. Jesunofsky.

Arkansas.—Unusually cool and wet. Farm work greatly retarded. Cotton made slow growth, was small, did not fruit well, and was injured by insects locally; some fields were abandoned on account of weeds. Early corn was laid by; late suffered from lack of cultivation and too much moisture. Wheat and oat harvest progressed slowly; some grain injured in shock by moisture. Apples and peaches deteriorated.—O. C. Burrows.

California.—Clear, seasonable weather prevailed in the interior and cool, foggy weather in the coast sections most of the month. The temperature was abnormally high in nearly all sections on the 7th and 8th, and in many places previous records were broken. Grapes, berries, and deciduous fruits were considerably injured by the heat. The hay crop was nearly all gathered and was the best for several years. Grain harvesting was nearing completion.—Alexander G. McAdie.

Colorado.—The prevailing droughty conditions in the southern and western parts of the State were effectively broken by showers toward the close of the month. During the last decade the harvesting of winter wheat, rye, and barley was progressing satisfactorily, as also that of spring wheat in Weld County, and the second crop of alfalfa in the Arkansas Valley; oats were ripening, and corn, beets, and potatoes were making good growth.—F. H. Brandenburg.

Florida.—The month gave normal temperature and practically the average amount of precipitation. The cotton crop did very well during the first part of the month, except over the western portion, where the weather was too dry. As the month advanced rain came more regularly and was frequently locally heavy, doing damage to cotton in central and northern districts. Late corn was improved, and a large acreage was set to sweet potatoes. Cane, citrus trees, pineapples, and minor crops did well.—A. J. Mitchell.

Georgia.—Temperature was about normal; rainfall irregular, most too wet the first and second decades, too dry the third. Cotton grew rapidly, made too much weed at expense of forms, needed rain at end of month, some fields grassy, injury by black root, lice, rust, and shedding; began to open south 25th. Early corn variable; late varieties injured by

rain first and by drought last of month. Fodder and hay being saved last decade. Peach and melon shipping about completed, latter good crop, former below average. Minor crops generally good. Large crop of peas.—J. B. Marbury.

Hawaii.—Weather warm and sultry during entire month, with rainfall considerably above the normal in many sections. Some damage occasioned to growing cane at intervals by high winds, but conditions otherwise generally favorable for rapid progress. Grinding of 1905 cane nearly finished, with a satisfactory yield; planting for 1907 crop continues. An exceptionally fine summer crop of pineapples being harvested; plants in excellent condition. Second crop of rice being planted. Coffee picking begun. Leeward pastures, except in higher levels, short during most of month.

Idaho.—The first half of the month was generally rather cool; the latter half was excessively hot in western and northern counties, causing some damage to late oats and spring wheat. Fall sown and early spring wheat yielding well. Corn made good growth. The portion of the hay crop harvested was average or above, but in some localities late crops suffered owing to scarcity of water. Grass on lower ranges became very short and dry, but in most instances stock found ample subsistence in higher mountains.—Edward L. Wells.

Illinois.—The month opened cool, with temperatures decidedly below the seasonal average. In low places in parts of the northern district light frost formed, but no damage was reported. During the first decade the harvesting of oats was begun in the central and southern districts, and wheat was mostly in shock and some thrashing had been done. At the end of the month corn was earing out nicely, having maintained a fine condition throughout the month.—Wm. G. Burns.

Indiana.—Cutting of wheat practically finished before middle of July. During the latter part of month cutting oats, making hay, and thrashing wheat progressed rapidly and generally with satisfactory results as to output and quality of crops. Corn made good growth and was mostly laid by in good condition. Cucumbers, tomatoes, melons, and tobacco did well and field onions improved. A large crop of blackberries was gathered.—W. T. Blythe.

Iowa.—July was deficient in temperature and rainfall, but there was sufficient warmth and moisture to promote the normal growth of corn, potatoes, and vegetables, and ripen wheat, oats, barley, and rye. Some hindrance was caused by showery and cloudy weather the first half of month, but during the latter part conditions were generally favorable for hay and grain harvest, with good yield secured. Corn in good condition at close of month. Apple crop very light.—John R. Sage.

Kansas.—Wheat harvest was over by the 15th, except in a few extreme northern counties; thrashing and stacking progressed rapidly, showing a fair yield and good quality. Corn grew rapidly and continued in fine condition; it was tasseling, silking, and earing in northern counties at close of month. Oat harvest finished, with fair yield and good quality. Prairie haying and fall plowing begun. Apples and potatoes good. Cutting third crop alfalfa began the last week.—T. B. Jennings.

Kentucky.—Temperature above normal at opening of month and again from 15th to 17th, but averaged slightly deficient. Precipitation in excess of normal, except in extreme northern and several western counties. Wheat harvested and thrashed, with slight damage from wet weather; yields varying. Oats and rye thrashed and stacked in good condition, with some slight damage from moisture. Hay plentiful, but poor. Tobacco generally vigorous, but needing cultivation; mostly topped and some cutting commenced. Fruit falling badly.—F. J. Walz.

Louisiana.—Showery weather prevailed during the greater portion of